$1.00

# HARD TIMES

## EMPLOYMENT, UNEMPLOYMENT AND PROFESSIONALISM IN THE SCIENCES

Prepared by
The New York City Chapter of
SCIENCE for the PEOPLE

First printing November 1974
Second printing July 1975

Science for the People
16 Union Square
Somerville, Mass. 02143

# HARD TIMES

## EMPLOYMENT, UNEMPLOYMENT AND PROFESSIONALISM IN THE SCIENCES

Prepared by
The New York City Chapter of
SCIENCE for the PEOPLE

Aristotle taught that the heavenly bodies, made of finer stuff than earthly matter, were propelled along perfect paths by the force of a tireless prime mover--and for over two thousand years this was believed. Then, amidst economic, social, and religious upheaval, a critical process was reborn that banished these spirits from the sky and revealed the stars and planets as material entities.

Since the 19th century, science has been seen by its practitioners and ideologues as a bright star of human culture, propelled along paths of logic by the force of special genius. The present employment crisis, while bringing distress and uncertainty to many potentially socially productive scientists, raises the possibility of a revolution in the self-understanding of scientists. The ideas which have mystified the underlying relationship of science to society have begun to lose their hold. The political and economic imperatives of modern capitalism and their role in determining the pace, content, and organization of scientific activity now come into sharper focus.

In an attempt to bring some of these problems down to earth, we analyze here the relationship between the crisis of the U.S. economy, the changing social function of science and the conditions of our lives as scientists and human beings. History may well liken today's scientific community to the pathetic scholastics who refused to view the threatening truths through Galileo's telescope, unless we break through the immobilizing ideology of a worn-out professionalism and see ourselves and our science as inextricably linked to capitalist society and its liberatory transformation.

## Introduction

The commonplace facts of the American economy--unemployment, layoffs, and job insecurity--have finally reached into the academic community. Hundreds of Ph.D.'s cannot find jobs in science. A 1973 report estimated that 1500 physicists in this country were competing for perhaps 150 academic positions(1). Recent claims that the situation has eased are true only to the extent that fewer people are going into science, not because there are more jobs available(2). At the same time the tight job market is being exploited by the universities at the expense of young academics. In the City University of New York the percentage of teaching done by low paid non-faculty adjuncts rose from 6% to 15% of all teaching between 1970 and 1973(3). A tenure quota system and post-tenure review have been narrowly averted in CUNY, but these moves were watched closely by other university and college administrations, and may be revived(4).

The response to this situation by influential figures in science has varied. Principal investigators don't like to lose their grants and their expressions of sympathy for out-of-work scientists are common. But the dominant sentiment is more along the lines of "a good student can always find a position." As Harvey Brooks of Harvard puts it, "Physics is inherently and fundamentally elitist"(5). In other words, if you can't get a job it's your own fault for not being good enough(6).

Of course this is absurd. Ten years ago, by this standard, all young scientists were "good" while today only some are. What these statements do express, however, is a major component of professional ideology; that we as individuals are personally responsible for our own

well being in the impersonal ebb and flow of the economy. Once internalized, this ethic distorts our understanding of the situation and leads us to emphasize our individual failings as the essential problem. We hardly consider that failure to beat out two hundred other applicants for one job means that the failure is not ours but is a reflection of the way our society works.

Blaming oneself is not only disturbing, it is self-defeating. Once we have laid the blame on our own errors it is a very small step to decide we can do much better next time and be the lucky one to "make it". Thus we are forced to compete against our peers in a rotten job market with very little chance of getting the satisfying and rewarding jobs, which we were led to believe would be waiting for us after graduate school.

In this pamphlet, we show that the current unemployment and underemployment reflect particular recent shifts in the American economy. Also, we will see that the confusion, frustration and impotence we feel in this situation is a direct result of the professional idology in which we have been schooled for a good part of our lives.

To show this, we first develop, in Section I, a model of the part played by technology and science in the larger economy. We describe, in Section II, the changing positions of scientific workers in this picture. We then return to professionalism in Section III, and discuss it as a component of the economic structure of modern America with historical roots and a definite social function. We hope that the analysis presented here will serve as a catalyst for further debate and ensuing political action.

Only in the context of actually doing something about our situation can we hope to understand it fully or to change it.

## Section I--Economic Roots of the Job Crisis

"The demand for workers necessarily governs the production of workers as of every other commodity. Should supply greatly exceed demand a section of the workers sinks into beggary or starvation. The workers condition is thus brought under the same condition as every other commodity and it is a bit of luck for her or him if he can find a buyer. And the demand on which the life of the worker depends, depends on the whim of the rich and the capitalists."

Karl Marx
Economic and Philosophic
Manuscripts of 1844

The recent crisis in the funding of scientific research represents a levelling off of Federal support for research and development (R&D), rather than an actual cut back. Its effect, however, was heightened greatly since it came on the heels of twenty years of steady growth in R&D funding following World War II. By 1968 the growth of R&D funding had slowed to 6% per year, a rate commensurate with the rate of growth of the economy at large. Thus its leveling off after 1968 reflected a new attitude on the part of the Federal government that, given available resources, there was enough science in America(7).

To understand this shift in attitude toward R&D we must deal with two questions: Why do the government and private industry support research and development? What resources do they perceive as available for this purpose? We begin be suggesting four important roles for research and development in Part A, the Role of Science in the Economy, and then turn to the question of available resources in Part B, The Fiscal Crisis of the State.

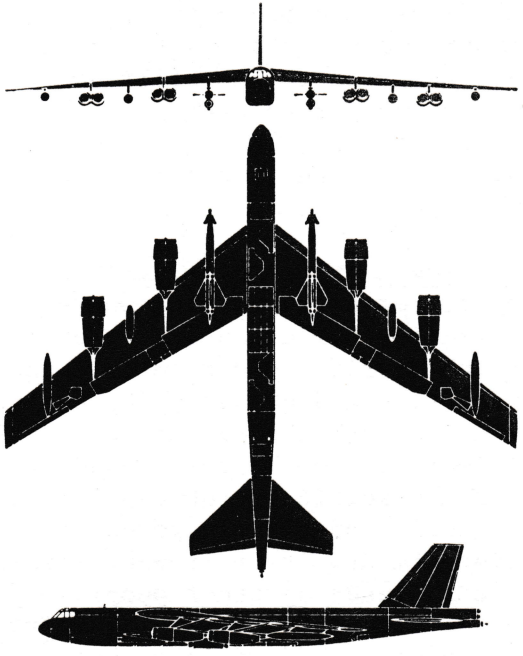
## A. The Role of Science in the Economy

Maintaining the Empire. The best known benefit of science and technology to government is the continued development of sophisticated weapons technology--from the atomic bomb through infrared "snooperscopes" and the ABM systems. In 1946 General Dwight Eisenhower described the motivation for supporting R&D after World War II and the shape it would take:

> "...the Army effectively discharged [its responsibilities] only through the invaluable assistance supplied by our cumulative civilian resources in the natural and social sciences... This pattern must be translated

into a peacetime counterpart which will... draw into our planning for national security all the civilian resources which can contribute to the defense of the country. Scientists and industrialists must be given the greatest possible freedom to carry out their research...[to] establish mutual confidence." (8)

Note that this early directive describes many characteristics of the "military-industrial-university complex" such as autonomous contract research and the involvement of civilian talent not only in narrow hardware development but in strategic planning such as Jason(9). The use of advanced technology both in the "balance of terror" politics of U.S.-Soviet confrontations and in the suppression of national liberation struggles such as in Viet-Nam is a central



feature of American foreign policy. And this technology has been purchased through Pentagon funding of well over half of all federally sponsored R&D since World War II(7).

Maintaining the Arms-Makers Themselves. The security of the industrial sector is the second major benefit accruing to the rulers of America from funding the development of high technology weapons. It has been argued convincingly that the funding of R&D by the military has long since outgrown the needs of security, defense, or the preservations of "stable areas for investment." (10,11,12) The notorious attempt to implement an ABM system which would have cost 5% of the Gross National Product over a 10-20 year period(13) is a recent visible example of this practice. What is at stake is not "national security" but the economic security of the industrial side of the military-industrial complex. Profits for military industries averaged 17.5% of invested capital in the period 1962-1965 compared to 10.5% in the civilian sector(14). Compared to the billions of dollars that these percentages represent, the "professional" salaries that we once regarded as "a gravy train" were just a bone thrown to a dog.

Maintaining Growth in Domestic Markets. One of the driving forces of capitalist society is the continual need for new areas of corporate investment and profit. One result is the continuous innovation and change which has brought about incredible increases in the productivity of people's work in the last few hundred years. Another is the electric toothbrush. While the rest of the world constitutes potential new areas for investment, it is fraught with political "problems" based on other people's reluctance to be developed by the U.S. A more secure area is to expand the domestic market through

the sale of new technologies--telephones, pocket calculators, nuclear reactors--some useful, some frivolous, some dangerous.

But the economy is now more complex and the capital necessary to develop a new technology to the point where it is profitable has grown too large for single corporations to accept the risk. Their solution is to get the people to foot the bills for civilian R&D through taxes. There are many examples. Synchronous communications satellites were turned over to COMSAT, a consortium of space contractors controlled by AT&T, which now owns and operates the satellites at a profit. They were developed at our expense by the National Aeronautics and Space Administration (NASA), which still launches them for a nominal fee. From contract R&D on nuclear submarines, Westinghouse developed the skills it now uses to produce nuclear reactors for the electric power industry. Boeing developed a flying gas tank, the KC135, for in-flight refueling of Strategic Air Command bombers on Air Force contracts--then they punched holes in the sides for windows, added seats, and the 707 was born.

It's a neat arrangement. The corporations profit from government research contracts and then profit again by selling the fruits of this research on the civilian market.

Maintaining the Whole Mess. Technology and science are now fully anchored into the American economy. Over 50% of the top 500 (or 100, or 50) corporations are major Department of Defense contractors. This integration of the military-industrial complex into the economy is the key to the final and most important benefit accruing to the American ruling class from its maintenance of science and technology. The maintenance of government-funded, corporate-

based science and technology has played an important role in keeping American capitalism functioning since World War II.

Capitalist economic systems suffer from recurrent crises typified by stagnation, unemployment and/or inflation. A few of the reasons may be stated succinctly (see References 15 and 16 for a more complete development). The basic goal of the capitalist is to maximize his surplus which he does by getting the people who work for him to produce more goods for the same or less wages. He accomplishes this by reinvesting previous surplus on better machinery or by speedup. The fundamental contradiction is that the people who are asked to produce more for the same wages <u>are</u> the market for most of the goods they are producing. There is no

way for them to come up with the cash in hand to buy all the goods on the market even if they wanted to, so, if the system is to function, it must run on credit(17). The social nature of production is the primary root of this contradiction. Without capital investment in machinery and highly coordinated labor, the surplus produced is so small that neither this tension nor economic growth occur. This was the situation before the rise of capitalism.

The tensions produced by the difference between the amount of goods available to people and their ability or desire to purchase them is both the driving force behind the unprecedented growth of capitalist economies and the source of the recurrent crises of overproduction. If consumption increases at a rate equal to the

rate of increase of productive capability the system will grow. If any significant sector falters the goods sit on the shelf and a self-reinforcing downward spiral begins. It becomes a crash when personal and corporate credit ratings drop significantly, since much of both consumer purchasing and corporate expansion is done with borrowed money. One primary problem of capitalism then is how to keep everyone buying, and, contrary to popular confidence in Keynesian solutions, this problem is unresolved.

Advertising helps. Visions of the good life help, up to a point. But nothing sells like fear. The Russians are coming! The Chinese are coming! The missiles are coming! This has worked for twenty years. It doesn't look like selling because it is done by the government through taxation. But this is only half the story. No one would take out a personal "missile loan" if they had the choice. The government, using the force of law, appropriates our money and spends much of it on junk, forcing us to take loans for necessities like housing and transportation.

But why junk? Why can't the government continue to force spending by taxing us, but spend it on socially useful items like mass transit? First, if useful social services (like mass transit) were more available, we would borrow less, (since we wouldn't need a car as much). Secondly, if all the monies now shot to the moon or buried in missile silos were applied to socially useful ends, the productive capacity of the country would grow so rapidly that the strains between productive and consumptive capabilities would further increase. A large fraction of America's surplus must be thrown away, rather than reinvested, if the economy is to survive. The military-industrial complex has stabilized

American capitalism for the last 25 years by throwing away the fruits of our labor.

Economists Paul Sweezy and Harry Magdoff have demonstrated this waste dramatically(18). By using conservative estimation methods, they calculated for the year 1970 both the number of workers unemployed and those directly and indirectly dependent upon military spending for their jobs. Using official data on labor force participation rates and adjusting for involuntary part time workers they reached an estimate of 8.1 million real unemployed (9.4% of the total available labor force). To this they added those in the armed forces (2.9 million), civilian employees of the Defense Department (1.2 million), those employed in producing goods for the Defense Department (3 million), and those employed in satisfying the demand generated by the incomes of those directly employed by the military budget (7.1 million). These total 22.3 million, just over 25% of the 1970 labor force! This figure is comparable to the unemployment rates during the Great Depression. For example, the official unemployment rate in 1938 was 19%. (Using the same method as above to calculate unemployment, the adjusted unemployment rate in 1938 would have been 30%.)

## B. The Fiscal Crisis of the State(18)

We have seen in the previous section how science and technology provide the tools of war necessary to keep the third world in line; how the development and production of those tools provide an area of guaranteed profit for America's largest corporations; how government sponsored civilian R&D provide the scientific and technological basis for profitable new markets for these same corporations while taking the risk out of "risk capital", and finally we have outlined how this whole boondoggle serves as a convenient way to force the American people to subsidize, through taxes, the stabilization of an economic system the might not otherwise survive.

However, the powers of the state to tax are limited by the resistance of the taxed and science and technology is only one of several broad areas that enlist heavy financial support from the government. Some of the other areas are:

Education. Advanced technology requires increasingly higher levels of education for the work force. The dramatic increase in Federal funding of higher education since World War II shows that the government will continue to pick up the increasing portion of the education bill which cannot be squeezed out of the population in the form of tuition.

Unemployment relief. The increasing level of technology has the effect of throwing people out of work. Apparently it has been cheaper to support people on welfare at the taxpayer's expense than to retrain them.

Pump-priming. The saturation of domestic markets requires that the government take actions to force new mode of individual consumption. For

example, the Interstate Highway System has encouraged driving and diverted monies from more rational modes of mass transportation, and thereby maintained the growth of the automobile industry, and the profits of the oil companies.

In contrast to the expanding character of these expenses, governmental fiscal resources are extremely limited. Their primary source, of course, is taxation. But increasing taxes at the rate necessary to keep up with expenses would appear to be a political impossiblity in an economy where the "real" income (income after taxes, adjusted to compensate for inflation) peaked in 1960 for private sector workers and in 1965 for public workers, and has dropped since(19).

Financing projects through the sale of government bonds and securities is also limited, since financial institutions demand that monies borrowed by a government be used to expand the tax base of the government, thus assuring repayment. It was easy to float the millions of dollars worth of bonds necessary to construct the New York City subway system at the beginning of this century, since it was clear that this would contribute to widespread economic growth and increased government revenue. But it is virtually impossible to do the same for programs like social security, pensions and unemployment insurance since they do not generate revenues and contribute little to economic growth. Yet this is precisely where government expenditures are rising most sharply.

Faced with inadequate financial resources to deal with their responsibilities, federal, state and local governments are cutting costs wherever they can. It is not surprising that these cutbacks should come quickly and sharply in the area of scientific research and development.

First, this area is directly under the financial control of the executive branch, via the Pentagon, and can be cut more easily than social welfare programs, which are more firmly under legislative control and subject to the slow-moving ways of Congress.* Second, scientific R&D really represents a long-term investment by society. In the short term it affects only a small sector of the economy, and even that portion can be "put on ice" for a period of a few years without any immediate adverse effects--except, of course, disruption to the lives of a relatively small number of scientists and engineers. (We need not be too jealous of the social welfare sector, however. Science may have started the downhill slide a few years

earlier, but recent budget cuts and impounding of funds, and the ruthless cutting of welfare rolls in large cities like New York make it clear that very little is sacred except Lockheed. Welfare for the corporations is good, for the people it merely increases "indolence". As the old saying goes, it's socialism for the rich and free enterprise for the poor.)

The question remains, "Why now?" Why did the government run out of money 25 years after World War II? Obviously the model presented here can only identify pressures on government, if can't predict when the fiscal lid will blow off. However, it now appears that the balance was tipped by the unanticipated expenses of the Viet-Nam war(20). Partly because of the unpopularity of the war, and partly because he probably did believe he could "whup the little fellows in a few months", Lyndon Johnson financed a large fraction of the war by deficit spending. At the end of the sixties, the Nixon administration took a number of steps to control the resulting inflation and, as noted above, research and development is one area where the minimal political repercussions invited very

---

* The differences in flexibility between Congress and the executive flow from their respective power bases; the executive is more in touch with the national and international monopoly corporate interests, while Congress is elected by and responds to a large number of smaller interests--small or local industries, farm blocs and the like. The indecision and inflexibility of Congress reflects the paralysis of small capital being gobbled up by big capital, while the growth of the executive in this century reflects the growth of monopolistic national corporate powers.

close trimming. The budget cuts eliminated the jobs of a large number of scientific and technical workers. The shrinking job market also took its toll on the schools, as students moved into more promising areas of work or dropped out, and faculty desperately created new courses in an attempt to hold onto their jobs.

## Conclusions

We have outlined a structural analysis of the place of science and technology in the American economy. We have seen how military technology serves as a vital link in maintaining the American empire abroad while allowing exorbitant corporate profits at home; how the government sponsors corporate research only to turn the results over to private industry should the research prove economically successful, and how all these processes are assorted parts of an operation that can only be characterized as the government keeping the engine of corporate capitalism operating by continually running the starting motor. But this process is becoming more and more difficult as the fiscal resources of the state dwindle relative to the demands placed upon it. Thus as governmental manipulation of the economy becomes more desperate, science and technology, by virtue of its Pentagon funding base and its lack of political clout, can expect to be among the most manipulated sectors of the economy. This is the source of the present job crisis. And while the situation may improve from time to time as the economic situation temporarily improves, it will also worsen rapidly whenever governmental cutbacks are called for.

Nevertheless in the long term, scientific and technical workers are needed by the economy to develop technology that will open up new areas

US arms captured by Vietnamese forces

for investment, to maintain existing technology, and to stabilize the environmental pollution resulting from unencumbered industrial growth. To ensure continued involvement of employed scientists and technicians toward these goals, the current lack of jobs is being used to strip us of professional privileges, while the "duties" of the professional increase without limit(6). This is the process of proletarianization, and the rest of this pamphlet will describe how this is being carried out on the job--how our professional ethics, no longer appropriate to the political and economic situation at work, keep us from understanding that our jobs are becoming the scientific and technical equivalent of wage labor.

# Section II--A Good Student Can Always Find a Position--Working Conditions of Academically Employed Scientists

In the preceding section we attempted to demystify the economic forces which are causing widespread unemployment and underemployment among younger scientists(1). We now want to consider how the same trends which produce unemployment cause analogous problems for those of us fortunate enough to have jobs.

The university scientist active in the two decades following the second World War could have easily been convinced that the post-scarcity society was at hand--at least in the academic world. These were the days of numerous highly paid job opportunities, two months extra for summer research, travel money, secure tenure, grants galore, eager students and individualized teaching. All of these are vanishing.


"Sure, I knew the rich were getting richer and the poor were getting poorer—but I thought I was one of the rich ones."

As a result of the same fiscal crisis that is producing un(der)employment, academic scientists are now subjected to greatly increased teaching loads (which creates further unemployment) travel costs and publication fees paid only for the elite, tenure quotas, possible post tenure review and forced early retirement. For academic scientists this process of rationalization means the application of efficiency standards to scientific activity so as to insure the output of research deemed eventually useful to the capitalist economy and to ensure the production of trained workers, all at minimal costs.

The transformation of the role of the university has been achieved by the re-organization of higher education into an array of systems which almost perfectly reproduce the class structure of the larger society. Within a typical state there is usually a prestige university (or two) which boasts of the research profs, institutes and labs, money, and an eager stable of graduate students and post-docs. In California, for example, the University has one-third the students and gets two-thirds of the money compared to the state colleges. One role of these schools is to produce high powered science--in an appropriate mix for industry, the military, or "for its own sake", depending on funding and marketing conditions in each of these categories.

Next in the pecking order comes a system of state or municipal colleges which are either brand new or trace their roots back to pre-World War II normal schools or teachers colleges. These have been upgraded from their previous status and provide training for middle level posts in various sectors (such as government and other service bureaucracies) or preparation for graduate work for their "brighter" students.

The real innovation, however, has been the massive growth of two-year community colleges

within and near most urban areas in the country. These are administered at all levels of political and educational organization--city, county and state. These were not spontaneous eruptions onto the education scene, but were carefully thought out and introduced through efforts of the leading corporate foundations such as Carnegie and Ford. Touted as the way to reach people where they're at and to democratize higher education, they have in reality been an important tool for reproducing the U.S. class structure at a higher level of overall technical competence.

Some of the key features of these new educational structures are as follows:

1. The present system, even in its own terms, shortchanges students in the lower tracks. Given a narrow range of technical skills, they usually face a dead-end job slot and technical obsolescence. "Upward mobility" for this group as a whole is a pernicious myth.

2. These systems are financed out of the tax monies of the working and middle classes to provide free-of-charge training for the corporations. Real estate, banking and construction interests provide trustees for the education boards, which control educational policy.

3. Students at the various levels are given either an artifically diminished or inflated conception of the importance of their social and technical roles: preparation for relationships of submission and domination rather than organic cooperation. That is, the division of labor necessary for a high level of human existence is artificially equated with an unequal division of status, wealth, and power.


EDUCATIONAL SYSTEM
UNIVERSITY
WATTS/73

4. Students at all levels are systematically deprived of broad training and experience. (The physicist doesn't learn how to harden a steel tool and the technician doesn't learn about crystal structure.) Such training is essential for democratic and rational control over production as a whole, and would permit the constant expansion of the scientific, technical, and cultural level of the entire population.

Thus the positions that the "good" science students were supposed to find turn out not to be the fantasized jobs of oak paneled offices and unfettered research. Young academic scientists who have avoided unemployment are often only marginal members of a department--post-docs, adjuncts, non-tenure accruing teachers, etc. They are caught in the vicious contradiction of having to publish madly to outrank the other 300 applicants for the few potentially permanent jobs while experiencing an uncertainty and demoralization which makes the intense research commitment called for all but impossible practically and psychologically.

In short, the scientist suffers the alienated condition common to all workers in capitalist society. Our labor is not our own. We are forced to work on problems we might not consider useful or interesting, simply because they are "publishable". If we are teaching we do not have the support and freedom to genuinely solve the educational problems we are faced with, whether they are big city problems of inadequate student preparation or the suburban problems of parochialism and student boredom.

This situation is a manifestation of the fundamental social fact of capitalist society--the class division between those who control the

socially produced material and intellectual resources and those who produce those resources in the first place. The totality of daily activities in which workers collectively express their labor power--in the fields, in the factories, and in the laboratories--is channeled into forms which enrich the class in control of those activities, and which reproduce the class system itself.

This class structure does not simply mean the lack of real democracy or equality within an otherwise efficient system. The deepest meaning lies in the fact that humanity as a whole is denied an adequate material and cultural existence because it cannot rationally organize its activities for itself.

As a result, the products of scientists activity stand before them and the rest of the people as alien and threatening, not only in the enhanced power it gives to the capitalists, but ultimately in the form of environmental degradation and the dehumanized social world of technological capitalism.

## Section III--The Ideology of Professionalism

"Modern science was initially conceived of as being impermeable and indifferent to human concerns, and concerned only with dominating nature. It was not intended to serve the mass of the people in their daily struggle; it was meant primarily to serve the ascending bourgeoisie in its effort at domination and accumulation. The ethics and ideology of a Puritan ruling class clearly shaped the ideology of science, generating the notion that the scientist must be as self-denying, insensitive and inhuman as the capitalist entrepreneur."

André Gorz
Address given to the Dutch Union
of Scientific Workers (BWA).
Liberation Magazine, May/June 1974

We have emphasized that the status of scientific work is strongly coupled with the diminishing options of the state as it oversees and perpetuates advanced capitalist society. The possibilities for employment, the direction and scope of both corporate and academically based research and development, and the ultimate social impact of science and technology are completely determined by this coupling. Yet this reality is not alive in the minds of American scientists and engineers. An analysis relating science to capitalism is not on the agenda of professional society meetings. Discussion of how scientific talent is channeled toward corporate rather than human needs is not overheard among industrial scientists. The self-criticism which would examine how research and training of technical personnel are molded by the imperatives of the military-industrial complex is absent from department meetings, as is the call for the revolutionary liberation of all human potential.

How can a group of highly educated individuals blind themselves to a reality which is profoundly affecting the character of their lives and work? How can they avoid asking the questions and undertaking the analysis that would lay bare that reality? How, in fact, can so many questions crucial to their existence be rendered non-questions? A major part of the answer lies with the phenomenon of professionalism. While the scientist or engineer functions as a worker for the capitalist system, he sees himself as something else, a professional, marching to the music of Newton, Harvey and da Vinci, only barely aware that the tune is being called by Rockefeller, Ford and duPont.

Large-scale professionalization of science first emerged in Germany in the 19th Century. Germany was just beginning its transition towards a capitalist economy of the kind already

established elsewhere in Western Europe. But unlike England, which had long been the home of the independently wealthy subsidized gentlemen-scientists, the emerging German society developed a large community of professional scientists. How did this evolve?

To understand this, we must first look at England where, in the revolutionary 17th Century, struggle between the feudal (landed) aristocracy and a rising bourgeoisie culminated in the important political victories for the new capitalist class. By the early 19th Century, the last remnants of a tradition-bound feudal class were relegated to harmless countryside fox chases or had made their accomodation with the industrial and finance capitalists who were now flourishing under a *laissez-faire* state. This "hands-off" state was designed to service, not direct, the complicated machine of capitalism to enable its "benevolent, hidden-hand" mechanisms to function properly. While this included raising armies to keep foreign channels of profit open and to tame the workers made belligerent by extraordinary exploitation, it did not include such interventions as financing an organized scientific effort.

As the industrial revolution unfolded, the purely pragmatic approach which characterized the early innovators became increasingly guided by general scientific principles. James Watt and the steam engine gave way to Carnot and the 2nd law. Experience and craftsmanship became applied science, and science itself began its move from the periphery of society to its economic core. Yet the cultivation and institutionalization of science would have to await the emergence of a state strong enough to actively build the necessary internal structure for the growth of a modern scientific-technological capitalism characterized by industry,

finance, and large-scale organization.

In contrast to England, the economy and politics of Germany were, in the early 19th century, still dominated by a feudal, land based class (and a huge state bureaucracy in symbiotic relationship to it). Yet the continued existence of feudal relations was threatened both by the more potent capitalist systems to its west and the slow development of a capitalist class from within. The aristocrats, led by the militaristic Prussian Junkers (big landlords), faced up to their changing world by actively developing a uniquely German capitalism. The industrial and technological know-how already developed in other countries, but still confined to only the most advanced sectors, was utilized more broadly in the German economy, in a modern, more rational fashion, under the aegis of a strong state which could actively intervene in the economic and cultural affairs of the nation.

For example, aniline dyes were first discovered in England in 1856 by William Perkin. Although Perkin immediately set up a successful factory for their production, the existence of German industrialists willing to invest in new technologies enabled Germany to dominate the industry. By 1879, Germany was producing more than four times as much aniline dye as England. The development of an aniline dye industry and its associated research facilities was a major factor in the dominance of the German chemical industry in Europe until after World War I(23).

It was under these conditions that scientific professionalism arose. The economic conditions were right--both industry and science had developed to the point where scientific technology could be utilized in production, transportation, communications, warfare. And the political conditions were right--the state had developed

sufficiently to be capable of addressing the needs of German capitalism as a whole. This included support and encouragement for an emerging, self-conscious community of scientists organized into professional societies. The scientists saw this as part of the extension of the German spirit and culture into the domain of natural science. The ruling class saw it as part of the extension of German political economy into the terrain of advanced industrial capitalism.

Scientists from the U.S. and other countries visited Germany to observe the new technology in action and returned home to advocate greater support of science and to organize professional societies among their colleagues. The day of the gentleman-scientist tinkering in a homemade laboratory or chatting natural philosophy at the courts of Europe was past. A new breed of scientist emerged to take his place. Systematically trained at a university by the practitioners of a special discipline who certified him with an advanced degree, he became a paid, full-time practitioner himself, engaged in research and teaching. He was an expert, devoted to a narrow esoteric body of knowledge which was inaccessible to the layman and increasingly obscure even to other specialists. The scientist joined with his fellows to form new organizations to advance and legitimize their discipline and occasionally science as a whole. He saw himself as part of an elite community devoted to the pursuit of a pure and elevated scientific culture, which developed according to its own inner logic--ideally, divorced from vulgar society. He therefore expected, as this community moved into prominence, that his advancement would be based solely upon the quality of his work, and that he was to be judged solely by his peers in this special community. In short, he was a professional.


PASS THE EXAM! YOUR FUTURE IS AT STAKE!
EXAMINE THE PAST! YOUR PRESENT IS AT STAKE.
WOLINSKI

In analyzing scientific professionalism it is important to distinguish between how it shapes the activities of scientists and how scientists see themselves in the context of these activities. Scientific professionalism can be seen as a social phenomenon representing an institutional form of scientific practice. As such it is part of the economic, political, and cultural structure of advanced industrial capitalism. It is also an ideology, a set of ideas and values through which the scientist perceives this reality and guides his behavior; it is the self-understanding of the scientist as he functions within this institutional framework.

For many years this ideology of professionalism could co-exist with its social reality. The principle of freedom for the investigator satisfied both the scientists' criterion of professional autonomy and the society's criterion of maximum research output. The dream and the reality coincided.

By 1900, scientists often spoke of "pure" science. The possibility of technological applications had been recognized, but much science was done without serious expectations of application. Physics in particular was not applied on a regular basis. During World War I the War Department, if it hired physicists at all, hired them as "chemists". But soon the situation changed. After the major advances in physics during the twenties, and the depression of the thirties, came World War II and the Manhattan Project, the prototype and epitome of "big science". By 1960, following Sputnik, science was being heavily supported by the government, largely for "national security" reasons. In this situation, professional ideology no longer even approximated social reality. Many scientists, dependent on industry and the government, were working at alienating, narrowly

technical jobs. This is especially obvious for industrial scientists and engineers (who constituted a majority of all advanced technical workers after World War II), for in industry the subject of the research and the hours and conditions of work are decided by management.

Today professionalist ideology is faltering as big science is increasingly wedded to the narrow policy criteria of the state and the profit criteria of capital. While our senior colleagues may long for the romanticized days of integrity and commitment in science, of quaint experiences with colleagues in Heidelberg or Vienna, of oak-panelled offices and individual freedom, there is no going backward. The earlier mystification of pure science as detached from social and economic needs is losing its power over those of us who have come to science in the age of aerospace and the electronic battlefield, grantsmanship and the Washington bureaucracy, scientific high-priests walking the halls of the Pentagon, and mountains of unread papers written only to have been published.

This is not to say that professional ideology does not have its positive aspects. As a "professional", the scientist feels obliged to maintain a high degree of scholarship and of objectivity and to maintain the highest possible standards of quality in his work. He is committed to the development of new techniques and to the expansion of human knowledge. He sees both himself and "his" technology as active forces in changing society in beneficial and liberating ways. Unfortunately, these positive self-images have come more and more into conflict with the realities of survival in the modern corporate state. The growth of research and development and the developing need of industry for a technically trained work force has led to a progressive loss of autonomy within science as

the organization for research and university teaching has become increasingly bureaucratized, directed and standardized. Scientific work itself has become more and more specialized, more and more fragmented, more and more routine. A heirarchical structure has developed in the laboratory, paralleling that which grew in the factory at an earlier time. As the imperatives of a scientifically intensive economy have invaded the classroom and the laboratory, the resulting "division of labor" has led to a situation in which scientists have little or no control over their own work, or even over the general directions of scientific research. Coming at a time when the fiscal crisis faced by capitalism has forced a reduction in the steady growth of support for scientific activity, this "proletarianization" of science has weakened the ideological role of professionalism within science.

These changes have put scientists in an ambiguous class position. They still have significantly higher salaries and better working conditions that the vast majority of workers. But tradition and professional ideology made them believe they have more freedom and influence than they actually do. As privileged proprietors of "mysterious" techniques, they are isolated from the working class. Both economically and culturally, scientists tend to identify with the bourgeoisie. But, as emphasized above, scientists are finding it harder and harder to maintain this position: the integration of technology into production has brought this self-image more and more into contradiction with the realities of their working conditions.

As these contradictions intensify, there will be pressures on scientists to rethink the meaning of science. Professionalism has prevented the political and economic discussions which could


Drawing by Ed Cruger

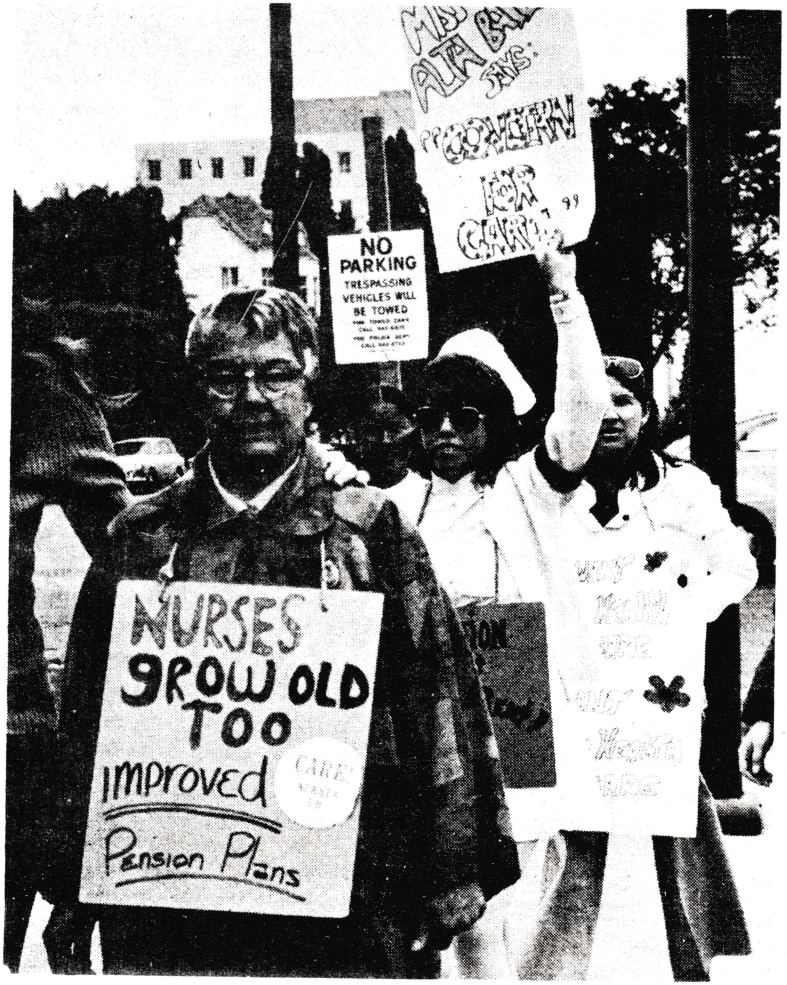
bring into focus science as it really functions. It has strengthened an amoral attitude toward science, allowing the professional scientist to work on such "interesting" problems as computerized bombing, developing deadly viruses and refining the chemistry of napalm. By mystifying science to the general public, by advocating in glorious terms the pursuit of science for its own sake, scientists have helped to shield the technocratic state from scrutiny. This also has had a distorting and conservatizing effect on research itself by closing off channels of criticism from within and without, insisting upon the rapid production of uncritical papers to satisfy sponsors, and prepare for landing jobs.

This professional ideology is still alive today--even in this minds of young scientists and engineers faced with unemployment and underemployment. The collective self-deception which was the professionalism of yesterday is transformed into the personal tragedy of today. In a world where "a good student can always find a position", self-blame is substituted for politically directed anger. Among professionals, organizing to struggle for challenging, socially meaningful work is out of order. Even as young scientists settle in for their fourth postdoctoral position, or drive up to the commune in the country, or hustle in their hack for another fare, they seldom realize that the agony of smashed expectations and the wasted decade of training indicts not them but capitalism. Personal inadequacy is perceived to be the culprit, not a system where profits and social control come first and people are either a means to it, or expendable.

This defeatism in the face of unemployment is one expression of the competitive individualism implicit in professionalist ideology. The

individual response of the scientist is complemented by that of the professional society as it addresses the problems of science as a whole by hustling for funds in Washington in competition with other interest groups. Thus, even when the professional society seeks to create more room for its members to compete with one another, it in fact only raises individualism to the higher level of institutional parochialism. Since the critique of the political and economic system in which science is embedded is absent from the professional arsenal, this narrow response is no surprise.

Professionalism and its consequences feed upon the notion that the scientist and his activity are part of a tradition carried on by an elite of individuals who have raised the "pure" face of science above the muck and mire of history. It is a perspective that raises science to a status above the process of human development of which it is a constituent part. In so doing it makes a fetish of the scientific community as the sole and independent creators of scientific knowledge, and therefore its proprietors. But science is collective knowledge of nature created by human social activity. Scientists must rediscover these roots of "their" culture. They can do so by taking part in the wider struggle to create a society in which science can realize its potential for the liberation of humanity from famine, exploitation, and meaningless labor.


NO
PARKING
TRESPASSING
VEHICLES WILL
BE TOWED
NURSES
GROW OLD
TOO
IMPROVED
Pension Plans

## Section IV--What Is To Be Done

Effective political work occurs only when people understand the dynamics of their situation and have a long range vision of the structures that will provide solutions to their problems. With this in mind we have looked at the situation of today's scientists and engineers within the broader context of the problems of contemporary capitalism. We have seen how the American economy is deteriorating in the face of domestic and international pressures, giving rise to a more or less permanent fiscal crisis of the state. With funds desperately short, each governmental body cuts back wherever it can--in education, health care, science, and welfare. Like so many others, scientists and engineers face the incredible irrationality of widespread unemployment and underemployment in a society faced with crying needs.

But economic crisis is not the only consequence of capitalism. As the French writer André Gorz recently observed:

> "Scientific and technological development is not an entirely autonomous and ideologically neutral process. It reflects in its general tendencies (the questions it raises and those it leaves aside) the demands made upon the research potential by governments as well as by corporate groups. Thus it is conditioned by the prevailing ideology--that is to say, by the ruling class's idea of the purpose and social function of science--and governed by the social relations of production.
>
> The result of this is that the unequal development of disciplines leads to a distortion that partly sterilizes scientific progress as a whole. The very rapid progress in electronics, synthetics, metallurgy and nuclear physics, for example, is offset by far slower progress in preventive medicine, psychiatry,

> pedagogy, and ecology, and also in those intermediate disciplines that allow the spread of knowledge and its social valorization. Generally speaking, the techniques for the dissemination of knowledge are falling increasingly behind the techniques for the acquisition of new knowledge, theoretical synthesis is falling behind highly technical specialized research, and the application of science to the problems of social and economic development (the major problem of this century) is falling behind its use for military and commercial purposes."(24)

Is this not an accurate description of the condition which physicist David Bohm has called "the fragmentation of [both] science and society?"(25) That is, despite government planning and investigations on many fronts, the net results of scientific development are largely anarchic. Progress among various disciplines is uneven and scientific knowledge is increasingly fragmented. Science is therefore part of the problem of cultural disintegration, at present, rather than part of the solution.

Obviously, there is very little that an individual scientist or engineer can do to change our immediate situation. This system may help us occasionally in the short run, but in the long run it offers nothing but unending insecurity and crisis. Further, as America loses its position as the pre-eminent world power, as its economy becomes less competitive on the world market, as its empire shrinks, this country's economic situation can only get worse.

However, to add insult to injury, an old trick is being pulled on us--the victims of this economic system are being blamed for its faults. The ideology of professionalism makes scientists and engineers feel demoralized and personally to

blame for their plight. This undermines what should be our greatest source of strength--the knowledge that insecurity and unemployment are the common experience of most working people. A clear understanding of the needs and oppression we share with most of the people in this country is the key to political activities that can produce real and meaningful changes in our lives.

The fight against these attacks on science and our livelihoods must take place on three fronts simultaneously:

--We must strengthen our position as scientific and technical workers through such activities as unionization.

--We must strengthen our science, both by doing it in an anti-elitist manner and by careful and imaginative choice of research which can in some way "serve the people".

--And we must further strengthen ourselves organizationally by building a political movement strong enough to establish a society in which human values are placed above monetary values.

In the first of these areas, traditional trade union organizing can help protect our salaries, our working conditions, and our job security.

Ultimately, however, unions accept the "givens" of modern America and the sight of the New York City construction unions lobbying for an eight-lane interstate highway down the west side of Manhattan while the mass transit system rots raises the spectre of a Scientist's Union lobbying for more money for missile research. Thus we must not only work in unions to protect ourselves, but to build unions and other political movements into a force that can change the face of America and create a Science for the People.

Camouflaged in straight clothes, a group of women from the Berkeley and San Francisco Women's Health Collectives regroup after disrupting an AMA gynecology workshop

What is Science for the People? On one level--that of the subject matter of science--the answer is easy: research and development efforts must be turned away from massive, expensive research projects of little use to any but ourselves or corporations (such as the development of more "efficient" missile systems or bigger particle accelerators), and aimed at the areas where a lack of technical progress is contributing to the gradual deterioration of the standard of living in the industrialized and third world nations. Examples range from large scale projects on energy sources and storage systems, or on the current wholesale unbalancing of the earth's ecological systems by industrialization to smaller, community-based projects on health care, workplace hazards, or research/action projects on local utility companies. Clearly, the latter types of project are the place to start, and such projects are being carried out by local Science for the People groups today. The large scale projects, to the extent that they are now being funded by government and industry, provide at best an area where researchers can work with some sense of purpose, although the treatment which previous "beneficial" scientific discoveries have received at the hands of capitalism (atomic energy, for instance) should make clear that technology is not a "fix" for any of our problems, although it may be a prerequisite to their solution. In a few years, however, with a considerably larger and stronger Science for the People, or with movements growing out of union work, it will be necessary to begin a struggle around scientific priorities and programs on a national scale, and current local struggles should be seen in part as leading into that larger arena.

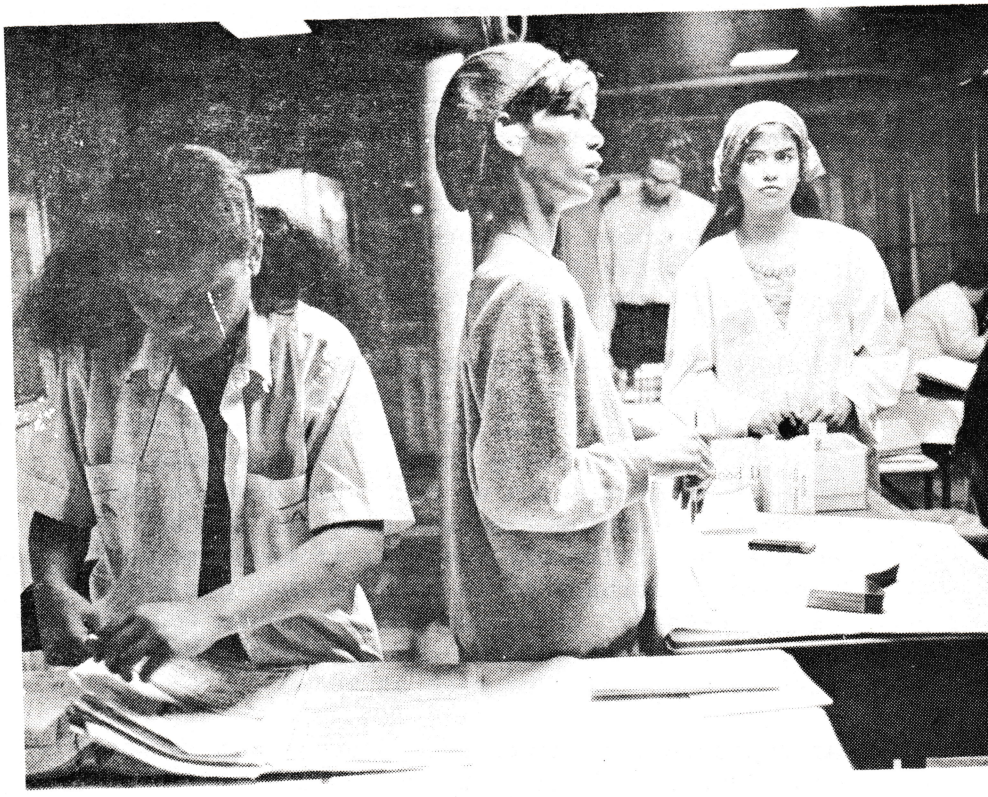
On another level, Science for the People implies a different way of doing scientific work, based on a conscious attempt to replace competition

with cooperation, hierarchical structures with more egalitarian work relationships and an elite image of science with a demystified, comprehensible body of knowledge available to the larger public. To the extent that two or more research groups independently pursue the same project at a feverish pace, only to finish with identical results within a few weeks of each other, research effort is wasted. When a scientist hands a technician a hasty sketch or a secretary a scrawled manuscript while denying their involvement in the content of the work, the work is slowed and weakened, both because they cannot contribute fully to something they do not understand, and because of the gradual buildup of antagonism and layers of distrust. (Note that we are not saying, as modern management does, that workers should "feel" involved in the decision making process; we are saying they should <u>be</u> involved in it.)

Finally, while the public thinks of scientists as magicians, practicing arcane and incomprehensible arts, it will in the long run become aware that it is being "had". For the sake of the future of science we must come down on the side of explaining research projects to the people who ultimately fund us; if they are not impressed, perhaps it is because that project is not needed. If we are doing science for the people we should rely on the people to define its goals at least as much as we do.

Attempts to implement these proposals meet heavy resistance. If small efforts on a local level take hold and grow, they soon find that the problems are larger than the local community and that a national organization or movement is a necessary next step. We need not only a national organization of scientists, but a national movement of all people to turn the priorities of America around, and establish

a society where our labor is rewarding because it is determined by people's real needs rather than one in which all labor is organized for the power and profit of a few.



## References

### Part I

1. David Bowen, Physics Today 26, 9 (1973). Betty Vetter of the Scientific Manpower Commission has said that the unemployment rate for Ph.D.'s in the physical sciences was "well below 1.5%" for 1973 (Science, 5 April, 1974, page 11). In the flurry of correspondence that followed, Ms. Vetter was forced to admit that her figure included only those who were "unemployed and still seeking" employment. Her figures did not include those who simply gave up hope of a scientific job and went elsewhere (Science, 7 June, 1974, page 103). Her figure also excluded those in the post-doctoral holding pattern and those employed as part-time or adjunct faculty working for a fraction of the salary that the same duties would bring on a full-time basis.

   Another approach is to examine the fraction of <u>new</u> Ph.D.'s who are out of work. Compared to 200,000 employed Ph.D.'s, 1,500 out of work is a small number. But compared to the 500 new Ph.D.'s awarded each year, coupled with the enormous number of applicants reported for each avilable academic position, the number out of work is large. (Reasonable estimates are 100 applicants/positions. In the State of Massachusetts essentially no faculty jobs are expected to open up until 1980. Bull. Am. Phys. Soc. Jan. 1973) This means that the 1.5% figure is a public relations gesture, not an attempt to genuinely assess the situation.

2. Editorial, Physics Today 26, 92 (1973).

3. Faculty Senate News (CCNY) 2, #5 (1973).

4. The following recommendation was made by the CUNY Presidents' Committee on Tenure, April 19, 1973:

"That the Board instruct the Chancellor to report on the establishment of procedures in keeping with collective bargaining agreements whereby each college will be responsible for instituting a system of post-tenure evaluation and review. The present contract mandates post-certification evaluations and permits post-tenure evaluations. The process of evaluation should look both to the improvement of teaching performance and to the dismissal of tenured faculty when performance continues to be unsatisfactory."

The above is the third of four recommendations by the Committee. The others were for a five-year tenure plan, for tenure quotas and for external review of tenure recommendations, all of which are adopted by the Board of Higher Education of New York City on October 29, 1973.

5. Harvey Brooks, Science 174, 21 (1971).

6. IEEE Spectrum, "Who Gets Laid Off?", December, 1973.

7. National Patterns of R&D Resources, 1953-1973 (NSF Report).

8. D.D. Eisenhower, Memorandum on Scientific and Technological Resources as Military Assets, H.L. Stimson Papers, Sterling Library, Yale University. Quoted in

S.M. Melman, "Pentagon Capitalism", McGraw-Hill, New York (1970).

9. Berkeley SESPA, "Science Against the People, The Story of Jason." P.O. Box 4161, Berkeley, California 94704.

10. S.M. Melman, op.cit.

11. R.E. Lapp, "The Weapons Culture", Penguin Books, Baltimore, 1969.

12. S.M. Melman, "Our Depleted Society", Dell, New York 1965.

13. Ralph Lapp, "The Military Industrial Complex", NYT Encyclopaedia Almanac, 1970.

14. M. Reich and D. Finklehor, "The Impact of Military Spending on the Economy", in "The Capitalist System", Edwards, Reich and Weiskopf, eds., Prentice-Hall, Englewood Cliffs, N.J. (1972).

15. P. Baran and P. Sweezy, "Monopoly Capital", Monthly Review Press, New York (1966).

16. P. Sweezy, "The Theory of Capitalist Development", Monthly Review Press, New York (1972).

17. On October 12, 1974 Business Week ran a special supplement entitled "Its Debt Economy". The following passage is an unusually succinct description of the U.S. economy:

"The U.S. economy stands atop a mountain of debt $2.5 trillion high - a mountain built of all the cars and houses, all the factories and machines that have made this

the biggest, richest economy in the history of the world...The numbers are so vast they simply numb the mind: $1 trillion in corporate debt, $600 billion in mortgage debt, $500 billion in U.S. government debt, $200 billion in state and local government debt, $200 billion in consumer debt."

18. P. Sweezy, Monthly Review, April, 1973.

19. James O'Connor, "The Fiscal Crisis of the State", St. Martin's Press, New York (1973).

20. "Recession and Crisis", Radical America, Jan.-Feb., 1972.

21. Sam Bowles, talk at City College of New York, May 5, 1973. See articles on education in "The Capitalist System", Reference 14.

22. Newt's Guide to CUNY, Newt Davidson Collective, P.O. Box 1034, Manhattanville Station, New York, N.Y. 10027 ($1.00).

23 H. Rose and S. Rose, "Science and Society", Penquin Books, Baltimore (1969), p. 28.

24. A. Gorz, "Socialism and Revolution", Anchor Press (1973), p. 54.

25. D. Bohm, ed, "Revolution in Biology", p. 54.

This pamphlet was produced by the New York City Chapter of Science for the People. Contributors were Steve Bernow, Randy Fenstermacher, Mike Green, Arif Kazmi, Dave Kotelchuck, Dick Leigh, Paul Raskin, Joe Schwartz, Joe Shapiro and Paula Woletz.

We thank Joe Bowman of Madison Science for the People, Jim O'Connor and Mike Teel for detailed and helpful criticisms. A preliminary version was presented at the Spring meeting of the American Physical Society where it provoked much hostile comment. The manuscript was typed by Joan Arnold who showed great forebearance and skill in translating a sloppy copy into a beautiful typescript.

Credits: P.5, AVS/LNS; p. 13, Detroit's east side unemployment office: LNS Women's Graphics; p.17, Vietnam News Agency/LNS; p.23, Claudius/IDAS/LNS; p.31, GAR 26/LNS; p.35, Drawing by Ed Cruger; p. 38, Cathy Cade/People's World/LNS; p.43, Ralph Cook/ LNS; p. 46, Rising Up Angry Clinic- lab section Chicago, LNS Women's Graphics.

## About Science for the People

Science for the People is presently a loosely structured organization of national scope. There are approximately 40 chapters and contact people throughout the U.S. The bi-monthly magazine, Science for the People reports on political activities and works at developing a critical analysis of the political nature of scientific work from a radical perspective. Subscriptions are$12/yr or less depending on your means. Prisoners free. We also welcome and depend on regular contributions.

Science for the People
16 Union Square
Somerville, Mass. 02143